

9.7 WESTERN FEDERAL LANDS PROCEDURE

Replace the text of Section 9.6.1 with the following:

9.6.1 Standard Format for Plans

Project plans as described under Section 9.4.9 will be prepared using the guidance provided in this section. Following these guides will produce plan sheets that are accurate, neat, presentable, and that will reproduce legibly.

The following sections detail the format, drafting standards, and organization of the plan sheets into a PS&E assembly.

9.6.1.1 Format

Prepare all plan sheets using a CADD system. MicroStation from Bentley is the current FHWA standard CADD package. There may be some exceptions, e.g., conceptual drawing, architectural renditions, emergency projects, etc., to accommodate special needs of internal sections or cooperating agencies, but these should be few in number. When manual drafting becomes necessary, it should be accomplished in a manner that duplicates the appearance of CADD drafting to the extent possible.

Figure I shows a listing of sample plan sheets prepared using the guidance in this section. Hand-shaped symbols *<may use something else>* show the recommended text styles or fonts (FT), text sizes (TX), line spacing (LS), level (LV) *<perhaps not>*, line style (LC), weights (WT), and color (CO) to be used in the preparation of the plans.

Place a margin block containing the designer's name, checker's name, filename, and date on each project specific plan sheet.

9.6.1.2 Drafting Standards

The use of drafting standards establishes uniformity and quality in the drafting of contract plans.

When a CADD system is used to develop plans, the dexterity of a manual drafter is no longer critical; letter spacing is correct and lines are uniform throughout their lengths. However, a CADD system operator must have the same knowledge of drawing layout and detailing as a manual drafter to produce a good drawing. The CADD operator must use care in laying out details when placing text on a plan sheet. The relationship between the text and what it applies to must be clear.

Notes on plan drawings should clarify the drawing and provide necessary information for a complete understanding of the work. Notes shall be clear, concise, descriptive, and as brief as possible to convey the message. Do not include on the plan sheets any instructions covered in the specifications or information that would be more appropriate in the specifications.

Proper spacing between figures, symbols, and words will assure clarity, improve neatness, and increase accuracy.

Deviations from these guidelines are acceptable provided basic drafting practices are followed, and the deviation will improve the drawings. There are situations where the size and weights should be adjusted to emphasize or clarify specific information on a plan sheet. For example, centerline stationing along the plan alignment may require a heavier weight for clarity where culture or other background data tends to clutter the drawing.

9.6.1.2.1 Line Work

Use line weights to accent the proposed construction work. Make a good, clear delineation of all lines so the proposed work will stand out in contrast to existing features.

Do not draw hidden contours under a structure with the long dash line style (LC=3). Use the medium dash line style (LC=2) instead. Show hidden lines of structures with the same style.

Do not place lines, hatching, or patterning through words or figures. Place hatching at approximately 45-degree angle to the object being hatched.

See Figure F for standard line weights, styles, and colors.

9.6.1.2.2 Lettering

When placing text on plan sheets, do not crowd other information. Carefully choose locations for text labels that are as close as possible to the point of application. In general, show text labels identifying proposed work one line weight heavier than the text for existing features. Place text in a manner such that it is not upside down. Text is to be legible when the plan set is oriented either 1) with the binding on the left side of the plan set or 2) with the binding on the top of the plan set (rotated 90 degrees clockwise). Text orientation should be consistent on individual sheets.

Do not use the letters "I," "O," "N," or "Z" as cross-section indicators. I and O resemble symbols shown on drawings and N and Z are the same shape, but oriented 90 degrees. When you reach the end of the alphabet, use AA, BB, etc. Place the section letters at the end of the section arrow, not on one side.

Use abbreviations on plan and profile sheets only where there is not enough space to spell out the word. In instances where the meaning of an abbreviation appears doubtful, the word should be spelled out. Do not capitalize abbreviations unless the word or words represented are ordinarily capitalized, or unless the abbreviation itself has become established as a capital letter, such as N for north. A period usually follows each part of an abbreviation that represents a single word. This aids in quick interpretation of an abbreviation, such as "a.m.", not "am". The exception to a period following an abbreviation is with units of measure where periods are not used. The abbreviations shown on the "Plan Symbols & Abbreviations" sheet in Figure I have been adopted for use on plan sheets.

Use the true type font Verdana for most drawing applications. MicroStation text styles have been set up to automatically set the text font and justification. Text size and line spacing must be set separately. See FIGURE A for text style usage information.

Style	Usage
Normal (<i>modifier</i>)	Default style used for drawing and table text. No modifier means left justified text.
Straight (<i>modifier</i>)	Vertical text used in mapping and border cell text No modifier means left justified text.
<i>Modifiers for above:</i> Center: Right: CC: Title:	Center Top justified Right Top justified Center Center justified Bolded title text justified Center Center.
Estimate	Microstation font 3 used for the Summary of Quantities.
Font: Arial	Used for highway sign text
Font: Times New Roman	Agency text in title sheets

Figure A
TEXT STYLE USAGE

Standard lettering sizes are shown in Figure B. Text line spacing (LS) should generally be half of the text size. Line spacing normally equals the text size for table body text.

METRIC UNITS	Plot scale				Less used
Standard size	Scale	1:2000	1:1000	1:400	1:500
Corresponding Full size	Scale	1:1000	1:500	1:200	1:250
Minimum text size		2	1	0.4	0.5
File location and date		2.5	1.25	0.5	0.625
Sheet number block		3	1.5	0.6	0.75
Small text		3.5	1.75	0.7	0.875
Normal text size		4	2	0.8	1.0
Large text		4.5	2.25	0.9	1.125
Drawing minor headings		5	2.5	1	1.25
Drawing major headings, NOTE: and FOOTNOTE: text, Standard/Detail Title block text		6	3	1.2	1.5
Title block text		8	4	1.6	2
Plan/Profile length per sheet (m)		700	350	140	175

NOTE: Multiples of the plot scales (e.g. 1:4000, 1:20, 1:100, etc.) are also acceptable.

US CUSTOMARY UNITS	Plot scale			Less used
Standard size Scale	1" = 200 ft	1" = 100 ft	1" = 40 ft	1" = 60 ft
Corresponding Full size Scale	1" = 100 ft	1" = 50 ft	1" = 20 ft	1" = 30 ft
Minimum text size	8	4	1.6	2.4
File location and date	10	5	2	3
Sheet number block	12	6	2.4	3.6
Small text	14	7	2.8	4.2
Normal text size	16	8	3.2	4.8
Large text	18	9	3.6	5.4
Drawing minor headings	20	10	4	6
Drawing major headings, NOTE: and FOOTNOTE: text, Standard/Detail Title block text	24	12	4.8	7.2
Title block text	32	16	6.4	9.6
Plan/Profile length per sheet (ft)	3000	1500	600	900

NOTE: Multiples of the plot scales (e.g. 1" = 20 ft, 1" = 400 ft, etc.) are also acceptable.

Figure B
LETTERING SIZES (TX)

Place text labels with a leader line and filled arrowhead by using the built-in "Place Note" function. Use the Dimension Styles shown in Figure C to create labels and dimensions. This increases drafting speed and maintains uniformity.

Description	Description
Metric	Basic dimension and label style. Automatic dimensioning set up for Metric units.
US Customary	Basic dimension and label style. Automatic dimensioning set up for US Customary units.
Dot	Label with "dot" arrow terminator
Quantity	Larger quantity arrow for excavation and embankment

Figure C
DIMENSION STYLES

Use a "Footnote" to supplement labels where insufficient space is available at the label location. Use a "Note" for general information that is relevant to the entire sheet. Do not use the term "General Notes". When possible, place Notes and Footnotes on the right hand side of the sheet with Notes placed above Footnotes.

Write numbers with commas separating millions or thousands (i.e. 99,999 rather than 99999 or 99 999).

9.6.1.2.3 Color

Color may be used to clarify complex plan and profile sheets. Color plan and profile sheets should be considered for complex projects. When used, color plan sheets should be distributed for plan reviews and construction sets. Color plans will not normally be distributed to bidders. Shades of gray may also be used to clarify plan sheets. Standard

colors to be used for colored plan and profile sheets are shown in Figure D. By default color plotters will plot colors as they appear in the CADD drawing. Special pen tables are available that will plot drawings using the standard colors. These pen tables are set to “fade” and/or turn “gray” the existing features (levels E_*).

CADD Color	Plotted Color	Feature
CO = 0	Black	Information not listed below
CO = 1	Blue	Water (river and streams) (LV = E_HYD_)
CO = 2	Green	Trees (LV = E_VEG_)
CO = 3	Red	Proposed centerline (LV = P_HAL_), construction cut and fill limits (LV = P_RDW_Slope_Stake_Limits), and profile grade (LV = P_VAL_)
CO = 79	Purple	Proposed ROW (LV = P_RW_)
CO = 0	Gray	Existing features (LV = E_, selected)
CO = 137	Brown	Major contours (LV = E_GEO_Index_Contours)
CO = 6	Orange	Minor contours (LV = E_GEO_Intermediate_Contours)

Figure D
STANDARD COLORS

9.6.1.2.4 Levels

Specific levels have been set up for various functions and roadway elements as shown in Figure E. Place elements on the levels that best describe the element's purpose. See *<should we create a web page describing the level library>* for a complete listing of all levels.

Level	Description
D_Details	Geometry for general details
D_Dimensions	Notes, labels, and dimensions. Dimension elements are automatically placed on this level when using the Dimension Styles.
D_Tables	Tables
D_Sheet, D_WFL_Arch	Level for sheet borders.
D_WFL_Border	
D_ (others)	
E_	Existing Features
E_CR_	Cultural Resources
E_GEO_	Existing ground features
E_HYD_	Existing hydraulic features
E_MAP_	Existing mapping
E_NR_	Existing wetlands and vegetation
E_PLM_	Existing planimetrics
E_RDW_	Existing roadway edges
E_ROW_	Existing right-of-way and property lines

Level	Description
E_SUR_	Surveying information
E_VEG_	Existing vegetation
E_UT_	Existing utilities
P_BRG_	Proposed bridges
P_EC_	Erosion control
P_EOP_	Proposed roadway edges
P_GPK_	Geopak elements
P_HAL_	Proposed horizontal alignments
P_HYD_	Proposed hydraulics and culverts
P_LA_	Proposed landscaping
P_MISC_	Proposed miscellaneous features
P_NR_	Proposed wet land mitigation
P_RDW_	Proposed roadway appurtenances
P_SMD_	
P_STR_	Proposed minor structures
P_TC_	Proposed traffic control
P_UT_	Proposed utilities
P_VAL_	Proposed vertical alignments
X_	Geopak criteria levels
AUX_	Auxiliary levels for elements not otherwise categorized

Figure E
LEVEL LIBRARY SUMMARY

9.6.1.2.5 Stationing

Do not use "Station" or "Sta" as a prefix to station numbers. Any numbering including a plus sign (for example 2+959 or 30+00) is understood to be a station number.

9.6.1.2.6 CADD Filenames

CADD filenames will be unique, each containing a reference to the project followed either by a 4-character roadway design file type or a 2-character plan sheet type:

<PRMS unique designation> + <design or sheet file type> + .dgn

See [<insert WFLHD web site>](#) for PRMS project designations. All MicroStation design files will use the default extension DGN.

Most plan sheets are created with references to other roadway design files that contain the planimetrics (existing ground features), contours, and new work. Use the four-character suffixes shown in Figure F to describe these roadway design files. The final character(s) are reserved for a sequential number (e.g. *PLM1.dgn, *PLM2.dgn, etc.).

PLM	Planimetric files contain the existing physical features along the project corridor. Some WFLHD color pen tables are set to plot the existing features "gray".
CON	Contour files contain the surface lines representing points of equal elevation. WFLHD plotters (black/white and color) are set to "fade" the contours.
PRW	Property and R/W files contain the property lines and existing right-of-way information. After the proposed right-of-way is identified, this preliminary file is revised and returned to Project Development as a proposed right-of-way file. This file either has an extension of ROW.
ROW	Proposed R/W files contain existing property lines and both the existing and proposed right-of-way information.
HA	Contains horizontal alignments. Use a 2 character number at the end of the "HA" extension. (e.g. *HA01.dgn, *HA02.dgn, *HA03.dgn, etc.)
VA	Contains vertical alignments. Use a 2 character number at the end of the extension similar to the "HA" files.
SHP	Contains the superelevation shapes
PAT	Contains the cross-section pattern lines.
XS	Contains the cross-sections. Use a 2 character number at the end of the extension similar to the "HA" files.
DSL	Three-dimensional file containing the discontinuity and scan lines
DTM	Three-dimensional file containing digital terrain models created from project triangulation (TIN) files.

Figure F
DESIGN FILE TYPE DESIGNATIONS

Use the two-character suffix shown in Figure G to indicate the plan sheet's function.

AA-AZ	Title Sheets and Vicinity Maps	NA-NZ	Temporary Traffic Control
BA-BZ	Summary of Quantities	OA-OZ	Landscaping
CA-CZ	Typical Sections	PA-PZ	Permanent Traffic Control
DA-DZ	Erosion Control	QA-QZ	
EA-EZ	Drainage Tables and Details	RA-RZ	
FA-FZ		SA-SZ	Miscellaneous Details
GA-GZ	Plan/Profile sheets	TA-TZ	
HA-HZ	< reserved >	UA-UZ	
IA-IZ	< unused >	VA-VZ	< reserved >
JA-JZ		WA-WZ	Walls
KA-KZ	Right-of-Way	XA-XZ	
LA-LZ	Line Graphs	YA-YZ	Cross Section Sheets
MA-MZ	Material Sources	ZA-ZZ	

Figure G
PLAN SHEET TYPE DESIGNATIONS

See sample sheets in Figure I for examples of filenames.

9.6.1.2.7 Cell Libraries

Graphics that are used on a consistent basis such as plan sheet borders, key maps, and symbols are located in cell libraries. Cell libraries are located on the WFLHD network (currently at F:\V8_Resource\Cell_lib\) and on the [web](#).

9.6.1.3 Organization of Plans

Organize plan sheets to show a logical progression of the project work. Group plan sheets according to their type and give each section a sequential letter.

Follow the section order shown in Figure H. On most projects reserve Sections A, B, C, and D for the categories shown. Section E and following may be modified or deleted as applicable to the specific project. Other sections may be added as necessary. Sections should have sequential lettering. Designers should decide on an arrangement that best fits their needs within the guidelines. For instance, on a project that consists only of scattered work sites it may be advantageous to have a section for each site.

Number plan sheets consecutively within each section. Place tabulation of quantity sheets at the beginning of the section that shows the work item except as noted. The following discussion describes the content of the major sections.

INDEX TO SHEETS	
A. GENERAL INFORMATION	All projects
A.1 Title Sheet	
A.2 Plan Symbols and Abbreviations	
A.3 Vicinity Map	<i>As applicable</i>
B. SUMMARY OF QUANTITIES	All projects
B.1-? Summary of Quantities	
C. TYPICAL SECTION	Most projects
C.1 Tabulation of Typical Section Quantities	<i>Typical Sections and Tabulations may be on same sheet</i>
C.2 - ? Typical Sections	
D. PLAN-PROFILE	Most projects
D.1 Tabulation of Plan-Profile Quantities	<i>May be renamed "LINE GRAPH" or other type of plan sheets as applicable.</i>
D.? - ? Plan-Profile Mainline	
D.? - ? (Others if applicable)	
E. APPROACH ROADS AND PARKING AREAS	<i>Option: Could be split into two or more sections. May also be included in the Plan-Profile section.</i>
E.1 Tabulation of Approaches and Parking Area Quantities	
E.2 - ? Parking Area Plan	
E.? - ? Parking Area Details	
F. SOIL EROSION CONTROL	
F.1 Tabulation of Erosion Control Quantities	
F.2 Erosion Control Plans	
F.3 Section 157 Standard Drawings	
G. MATERIAL SOURCES	
G.1 Material Source Details	
H. DRAINAGE	
H.1 Tabulation of Drainage Quantities	
H.2 Drainage Cross-Sections	
H.3 - ? Section 602 Standard Drawings	
H.? - ? (Other standard plans as appropriate)	

INDEX TO SHEETS	
I. SAFETY FEATURES I.1 - ? Section 617 Standard Drawings	<i>Or other category, use same format</i>
J. FENCES, GATES, AND CATTLE GUARDS J.1 - ? Section 619 Standard Drawings	
K. MISCELLANEOUS	<i>Drawings that fit no where else</i>
L. WETLAND MITIGATION L.1 Tabulation of Wetland Mitigation Quantities L.2 Wetland Mitigation Plans L.3 Wetland Mitigation Details	
M. LANDSCAPING PLANS M.1 Tabulation of Landscaping Quantities M.2 - ? Landscaping Plans M.? Landscaping Details	
N. TEMPORARY TRAFFIC CONTROL N.1 Tabulation of Temporary Traffic Control Quantities N.2 Detour Plans N.3 Temporary Signing N.4 Temporary Traffic Control Details	
O. PERMANENT TRAFFIC CONTROL O.1 Tabulation of Permanent Traffic Control Quantities O.2 Signing and Striping Plans O.3 Signing and Striping Details	
P. BRIDGE CONSTRUCTION DETAILS P.1 - ? Bridge Drawings	

Figure H
SAMPLE SHEET INDEX

9.6.1.3.1 Title Sheet

The *Title Sheet* serves to identify the location and limits of the project so bidders can find it in the field. Descriptive terms appearing on the title sheet should be readily identifiable by the topography, culture, or by use of State highway maps. The following items should be included on the title sheet:

- Title and project designation (matching information in PRMS)
- Project length
- State, county, city/town, National Forest/Park, etc.
- Key map of the State showing project location
- Index of sheets. The sheet description should match the sheet's title block.
- Design classifications such as the current Average Daily Traffic (ADT), design year ADT, directional distribution (D) when available, percent trucks (T) when available, design speed (V) and maximum superelevation rate (e)
- Design consultant logo (if applicable). Place logo in lower left corner and ensure that the logo is not larger than two-thirds the size of the FHWA logos. Do not show an address or phone number on the logo.
- Consultant PE stamp (if applicable)
- Provisions for dates and signatures of the appropriate approving officials
- Standard specifications to be used on the project
- Project Location Map (See below for more details)

Prepare the project vicinity map using a scale ratio of 1:100,000 or larger. Show the project area, the nearest towns appearing on a State highway map, other roads, railroads, major streams, etc. In instances where sufficient information cannot be placed on the project vicinity map to adequately identify the project work, prepare additional vicinity maps on separate sheets. Additional details that help to clarify the limits of the work or provide data needed to conveniently bid the work are encouraged.

In addition to the above information, show the following on the project vicinity map:

- Distance from the project to nearest cities and towns linked to project termini
- North Arrow
- Location Map scale bar
- Beginning and ending stations or termini
- Schedule boundaries (when applicable)
- Material sources (when applicable)
- Disposal sites, stockpile sites, and storage areas (when applicable)
- Water sources (when applicable)
- Offsite Mitigation (when applicable)

9.6.1.3.2 Plan Symbols & Abbreviations

The Plan Symbols & Abbreviations sheet details all of the standard plan symbols and abbreviations currently in use by the WFLHD. This sheet is designated as Detail W(M)101-1. The symbols sheet was developed using the cells from the WFLHD cell libraries. Scale and cell name may be determined using Microstation's command "element information" on symbols in this sheet.

When a special symbol is required that is not included on this sheet, show it in a legend on either the first plan sheet where the symbol appears or on the left side of the first plan-profile sheet. Abbreviations not shown may be placed on the plans similar to the way symbols are placed or may be added to the contract as a special contract requirement under Subsection 101.03 Abbreviations.

The symbols and abbreviations should not be changed on a project-to-project basis. When a change is required in the Plan Symbols & Abbreviations sheet to satisfy WFLHD's needs, change the master file so all future projects will have the same symbols and abbreviations. This prevents the need to check all the data on the sheet for every project. This documentation supporting the design exception decision should be prepared at the earliest possible point in the design process and must become a part of the PS&E package presented to the owner agency.

9.6.1.3.3 Summary of Quantities

The Summary of Quantities tabulates, combines, and summarizes the contract quantities for all pay items. This summary informs prospective bidders where to locate work within the plan sheets, the difference between plan quantities and bid schedule quantities, if any, and expands on contract bid schedule information. It also serves as a helpful checklist to the designer to ensure that all elements of the design receive consideration.

This is generally one of the last plan sheets prepared in final form. The contents of this sheet are automatically generated using the Engineer's Estimate program. All the pay items are listed in numerical order and identified by appropriate descriptions. The bid schedule

quantities duplicate those in the contract. Show any pertinent information by the use of remarks or footnotes at the bottom of the summary plan sheet. Items of work paid for under the contract quantity provision of Section 109 should be identified when preparing the engineer's estimate.

9.6.1.3.4 Typical Sections

The Typical Section shows the shape of the finished cross-section with the construction limits, and represents the appearance of the completed project. It must be specific enough to describe the proposed work, its location, and material needs. Identify all functional elements of the typical section to a relative scale. Show widths in meters [feet] and show thickness or depth in millimeters [inches].

Use standard terminology matching the FLH Standard Drawings and the FP for features and pay items. Identify the following on the typical section:

- Indicate the location of the "Travel Way" and "Shoulder" on all sections where applicable
- Identify the typical section as "Mainline", the roadway name, or a specific approach road, along with the applicable stations (if more than one section), or companion site name by including a subtitle with each typical section.
- Use a "bubble" detail to clarify complex pavement structures.
- Use the full bid schedule item name to call out pavement structure features.
- Where an additional section uses the same pavement structure as the mainline, reference the mainline typical for surfacing depths (e.g. See Mainline Typical). This will reduce errors should the typical sections change during the development of the design.
- Include a curve widening table on the typical section if applicable. No slope ratio table is required.

Provide a slope rounding detail separate from the main line typical section. Show details for both the cut and fill slope rounding (if used). Separate details eliminate the need to duplicate these details on each typical section. Generic typical sections may be used to show different pavement structures and/or lane width/shoulder dimensions in one section to reduce the number of typical sections. Generic sections should be identified by TYPE (e.g. "Type 1" and "Type 2") using a table to describe the approach road station, type, class, roadway width, radiuses, etc.

Include the following notes as applicable:

- Superelevate roadway on curves at the rate 'e' as indicated on the Plan and Profile curve data.
- Construct slopes as shown in the Staking Report (see FAR 52.236-4).
- For cut heights less than the behind slope rounding distance (B), reduce the B dimension to the cut height dimension and reduce the front slope rounding distance proportionally.
- Apply [half of curve widening equally to both traveled ways] OR [full curve widening to inside travel way]. Curve widening is reflected in the field notes.

Place the tabulation of pavement structure quantities either on the typical section sheet or on the first sheet of this section. Show the estimating values (i.e. t/m³, lb/ft³) in the table for each item. (Refer to the Project Development Manual Section 9.4.10 for the appropriate

significant figures.) See Plan-Profile Tabulation of Plan Quantities section for more information on tables.

9.6.1.3.5 Plan-Profile

Under this subject area, the designer may incorporate plan and profile sheets, plan sheets, line graphs, or other descriptive sheets that describe the proposed work.

1. Tabulation of Plan Quantities. Place quantity tabulations for items pertaining to the plan sheets (i.e. roadway obliteration, roadway excavation, guardrail, fence, etc.) either on the first plan sheet or on a separate tabulation sheet before the plan sheets. These tables aid the bidders in precisely locating the work areas and determining the effort required to perform the work.

Tabulation of quantities sheets consist of detailed summaries of work items presented in a tabular format. It provides bidders with more detailed information on the location and extent of the work required than can be shown on the summary of quantities sheet. Tabulations should show how a quantity is developed, not just repeat the quantity shown in the Summary of Quantities. Arrange the tables by increasing pay item number. Tables may either be drawn using CADD software or created in a spreadsheet made to look like a normal plan sheet. The WFLHD cell library (work_dd.cel) includes a table cell called "table3" which may be used or referred to as a guide. Sample spreadsheets are also available as guides.

2. Plan and Profile. Prepare plan and profile sheets at a scale that is adequate to show the necessary details as governed by the topography and the complexity of the work. Plans usually have a horizontal scale of 1:2000 [1" = 200 ft] when prepared on a standard size sheet. Larger or smaller scales may be used depending on the amount of detail to be shown. Profiles have the same horizontal scale as the plan, but the vertical scale should have an exaggeration of 5 or 10 times the horizontal scale.

When laying out plan and profile sheets, avoid dividing major structures, highway intersections, interchanges, or grade separations between sheets. Use supplemental sheets as necessary to make these drawings as clear as possible. Leave approximately a third of the first plan-profile sheet blank. Leave a similar blank space after the end of project on the final plan-profile sheet. Use the blank space on the first plan-profile sheet for project specific legends, utility information (name, type, contact and phone number) and other miscellaneous information beneficial to the contractor. Except for the first and last sheet attempt to place 700 meters [3000 feet] on a sheet, at 1:2000 scale [1"=200 ft], and break sheets at even 100 meter station [10 stations] numbers. Increasing stationing runs from left to right.

3. Plan View. Show the following information on the plan view:
 - A prominent North arrow for orientation on each sheet.
 - All boundary lines, State, county, city, township, and section lines. Where ties are shown to section corners that fall off the sheet, break the line and show the corner with tie distance. Describe found corners and show their coordinates. Also show streams, lakes, swamps, estuaries, etc.
 - Include contours on complex projects on an as-needed basis. Fade or fade and color contours when plotted.

- When available show control point (CP) coordinates in a Control Point Table. Use a CP symbol and symbol number on the plan view.
 - Station coordinates and elevation of the beginning of the project and the end of the project on the first and final plan-profile sheets, as appropriate.
 - Include clear and concise labels and notes in the plan view. Ensure they are short and to the point. Utilize special details and special contract requirements to clearly define the work to be performed.
 - On all sheets show the construction limits, access control lines, easements, and right-of-way lines. Within the right-of-way, show all cultural features requiring relocation, such as utilities and fences (when not on the right-of-way line). Identify all ownerships for right-of-way purposes. Show all drainage structures. Show any cultural features adjacent to the right-of-way that may be affected by the project.
 - Curve data consisting of delta angle, radius of curve, tangent length, length of curve, and super-elevation should be shown. Curve widening may also be shown at this location. For spiral transitions, the spiral angle and length of spiral should be shown. Identify the station (0+000 or 0+00) at least 5 times per sheet along the centerline. Show bearings of all tangents.
 - Show the location of borings, test pits, or other sites where subsurface investigations have been made on the plan portion of the plan-profile sheet. Do not show actual log or test results on the plan-profile. Use separate plan sheets for this data.
 - Graphically show the proposed locations of culvert pipe (drawn to approximate skew), guardrail, wall, and other proposed work items. Where these items are called out in the profile view, no note is necessary in the plan view. Call out proposed work items either in the plan or profile view. Show exact station limits of proposed features in tables where applicable.
 - Call out removal items and roadway obliterations with a note and show in a table as applicable.
 - Include contours on complex projects on an as-needed basis. Fade or fade and color contours when plotted.
 - Include companion site's (turnouts, parking areas, etc.) mainline stationing, centerline, outline, and cut/fill limits. Include approach road symbols.
4. Profile View. On the profile portion of the plan-profile sheets show the profile grade and existing ground lines. Show vertical curve information including station, elevation, length, and curvature ("k" value). Place a note indicating the profile grade and existing ground lines. Show gradients on the profile to four decimal places, grade elevations to two decimal places, and natural ground points (if any) to two decimal places. Show vertical and horizontal clearances for railroads, highways, and streambeds under proposed and existing structures.

Also show the following information on the profile view:

- Identify locations for items such as underdrain, subexcavation, and special ditches within the profile view with a bar graph (preferred) or plan view (acceptable). Show exact stations, lengths, elevations, and other information in a summary.
- Place a note at the approximate locations of pipe culverts listing the size of the pipe culvert. It is not necessary to show pipe culvert symbols. Note exact station and lengths in drainage summary. Include Q25 and HW/D ratio for 1200 mm [48 inch] culverts and larger.

- Show bridges and major structures to be constructed on the plan and profile in outline only, with a note to see the appropriate drawings.
- Show the approximate location of guardrail on profile by using a bar graph. Use circles at end of bars with notation stating terminal end section type. Exact stationing is not required on the profile, but should be placed in a summary.
- Include a quantity bar showing unadjusted excavation and embankment quantities. Break the earthwork bars at the end of runs (i.e. If no earthwork is generated or required over a portion of the project, don't show the quantity bar in that location).
- Show proposed work items that have not been called out in the plan view.

9.6.1.3.6 Associated Roadways

Plans, profiles, and details for approach roads, parking areas, turnouts, and other associated roadways may be placed in a single section or in multiple sections as appropriate. It may be appropriate to include approach road plans with the mainline plan and profile sheets. The designer should make the plans clear to the intended audience.

Use unique stationing for designed approach roads and secondary roads. Ensure that the stationing is different than stationing found on the mainline (e.g. the first approach road begins with 1+000, the second approach road begins with 2+000, etc...). Label matching stations where the designed approach road or secondary road intersects the mainline (e.g. M.L. 23+59 = Appr. 1+00). Either use the abbreviations "M.L." and "Appr." defined on the Standard Symbols and Abbreviation sheet, or use the roadway names.

Provide elevations and coordinates for critical points within parking areas, if centerline and staking notes are not provided. Include note stating, "Elevations shown are to finished grade unless otherwise noted."

9.6.1.3.7 Erosion Control

The Erosion Control section consists of plans, detail drawings and standard drawings that detail the measures required to protect resources and to comply with permit stipulations. The plan sheet details should reflect Best Management Practices (BMP); comply with Erosion and Sediment Control on Highway Construction Projects, FHWA, 23 CFR Part 650, Subpart B.; and be in agreement with the stipulations in the National Pollutant Discharge Elimination System (NPDES) permit. Include erosion and sediment control plans for all applicable projects, not just large or complex projects. It is not satisfactory to leave the development of erosion and sediment control plans to the contractor or project personnel after project award.

As a minimum, erosion and sediment control plans should identify erosion and sediment sensitive areas and provide a mechanism for minimizing any adverse effects. The plan sheets should show the contours and proposed erosion control features. For complex and/or environmentally sensitive projects also include topsoil, permanent seeding, and mulching locations in the erosion control section rather than the plan profile section.

9.6.1.3.8 Materials Sources

When a material source is included, show the following:

- Baseline (Survey Data)
- Contours
- Disturbance limits
- Boundaries of the materials source
- Boundaries of main extraction area
- Maximum final slope ratio
- Rehabilitation Plan
- Geotechnical information
- Stripping notes
- Seeding plan
- Borehole locations
- Typical section for source development including benching requirements

9.6.1.3.9 Drainage

This section consists of the Tabulation of Drainage Quantities, details of large culvert installations, headwalls, inlet and outlet treatments, fish passage requirements, energy dissipators, catch basins, manholes, and other drainage installations. Drainage standard drawings should also be included in this section.

The Tabulation of Drainage Quantities sheet lists all permanent culverts and related drainage data. Show the location of the drainage installation under the station heading. Show related data in the row across the sheet under an appropriate column heading. Total the figures in the various columns to obtain the quantities to show on the summary of quantities sheet for the appropriate culvert item.

Provide drainage cross-sections for all culverts greater than 1200 mm [48 inches]. Show skew angle measured from a line perpendicular to centerline.

9.6.1.3.10 Other Sections

Provide separate sections for safety features (Items 617, 618, etc.), fences and related items (Items 619), and other items of work not described in other parts of the plans. These sections should contain the standard plans and other details pertaining to the work. Individual detail sheets that do not fit well into other sections may be placed in a Miscellaneous Details section.

9.6.1.3.11 Wetland Mitigation

Plan sheets for wetland replacement or mitigation are special drawings that detail all work required to ensure successful mitigation. These may range from simple sketches to elaborate contour grading and planting plans that conform to the commitments in the environmental document.

9.6.1.3.12 Landscaping Plans

Provide plan sheets and details showing the proposed landscaping plan.

9.6.1.3.13 Temporary Traffic Control

Provide details to assure safe passage of traffic through a specific project construction zone. Use a table format to list the required traffic control devices and signs. For most low volume roads provide standard traffic control layouts that conform to the MUTCD. For areas with complex traffic control, graphically portray the striping and traffic control device locations. For projects with complex schedules, provide a complete work schedule summary showing work restrictions such as road closures and environmental restrictions either in the specifications or the plan sheets.

9.6.1.3.14 Permanent Traffic Control

Provide tables and details showing the permanent pavement marking, sign, object marker, and delineator locations. For complex areas provide a graphical plan showing the proposed striping and sign locations in addition to the tables.

9.6.1.3.15 Bridges

The Bridge sections design most bridges and other large structures. Number the drawings properly for insertion in the final package. Structure sheets may be inserted into the plan package anywhere following the plan-profile sheets.

9.6.1.3.16 Contiguous Projects

A general plan or layout of contiguous construction projects may be beneficial to potential bidders in determining the cost of work on FLH projects. This is particularly true where another agency is constructing a project that will affect FLH contractors. It is essential that the relationship between the projects be well detailed on the plans.

There are instances where as-constructed plans should be included in the contract plan package. If a bridge or other structure is scheduled for salvage, a set of the as-constructed plans will greatly assist a contractor in determining the most effective method to disassemble the structure.

On occasion, right-of-way plans or utility plans may be too complicated to incorporate on the plan and profile sheets. They could be inserted into the plans under this subject area.